REVIEW OF AUSTRALIAN *PHILIRIS* RÖBER (LEPIDOPTERA: LYCAENIDAE), WITH NOTES ON VARIATION AND DESCRIPTIONS OF TWO NEW SUBSPECIES FROM CAPE YORK PENINSULA

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Abstract

The taxonomic status of the Australian species of *Philiris* Röber and variation in their adult morphology are reviewed. *P. diana* Waterhouse & Lyell is shown to be a species distinct from *P. papuana* Wind & Clench, *P. lucina* Waterhouse & Lyell is shown to be a species distinct from *P. nitens* (Grose-Smith) and *P. innotata evinculis* Wind & Clench is formally synonymised with *P. innotata* (Miskin). Two new subspecies from Cape York Peninsula, *P. papuana kerri* subsp. n. and *P. azula johnsoni* subsp. n., are described, figured and compared with the nominotypical subspecies from mainland Papua New Guinea. Nine species or subspecies of *Philiris* are recognised as occurring in Australia: *P. diana*, *P. nitens* and *P. lucina*, all with Lectotypes newly designated, plus *P. fulgens kurandae* Waterhouse, *P. papuana kerri* subsp. n., *P. sappheira manskiei* Ring & Olive, *P. ziska titeus* d'Abrera, *P. azula johnsoni* subsp. n. and *P. innotata*.

Introduction

The genus *Philiris* Röber is a group of Lycaenidae limited in distribution to parts of the Australian Region, including tropical and subtropical eastern Australia, eastern Indonesia and Papua New Guinea, but the genus is not known to occur in the Solomon Islands. Based mainly on specimens lodged in the Natural History Museum, London, the genus was revised by Tite (1963) and referred to the Tribe Luciini by Tite (1963) and Eliot (1973). Subsequently, d'Abrera (1971) illustrated representatives of these specimens and included new Australian records of *Philiris* spp. by Kerr (1967); he also described a new subspecies, *P. ziska titeus* d'Abrera, from Cape York Peninsula. Edwards (1996) provided a revised synopsis of Australian Lycaenidae and included new records of *Philiris* spp. by Johnson and Johnson (1984), while Ring and Olive (1997) recorded an additional species (*P. sappheira* Sands) from northern Queensland, previously known only from mainland New Guinea. In a major work on the butterflies of Papua New Guinea, Parsons (1998) considered New Guinea to be the major centre of diversity of the genus *Philiris*, with 53 species recorded, and referred to species also known from Australia. More recently, Müller (2002, 2014) described new *Philiris* spp. from New Guinea, while Braby (2000) and Orr and Kitching (2010) published comprehensive accounts of most of the Australian species, including their life histories.

The male genitalia of *Philiris* spp. were shown by Tite (1963) to greatly assist identification of similar species, but some identifications have continued to be difficult because of variation in adult morphology, particularly in females (Forbes 1977). This variation has led to unsupportable descriptions of new taxa from New Guinea (*e.g.* by Wind and Clench 1947, Tite 1963) and difficulties in associating females with conspecific males.

Figs 1-8. *Philiris diana* Waterhouse & Lyell: (1-2) ♂♂, (3-8) ♀♀; (1, 3, 5, 7) uppersides, (2, 4, 6, 8) undersides. Localities: (1-4) Kuranda, Qld; (5-6) Paluma, Qld; (7-8) Lake Eacham, Qld.

Here, two new Australian subspecies of *Philiris*, *P. papuana kerri* subsp. n. and *P. azula johnsoni* subsp. n., are described and changes to the taxonomic status of *P. diana* Waterhouse & Lyell, *P. nitens* (Grose-Smith) and *P. lucina* Waterhouse & Lyell are noted, together with lectotype designations for these three species in order to ensure stability of their names. A lectotype is also recognised for *P. fulgens kurandae* Waterhouse. Variation in morphology and summaries of their biology, when known, are reviewed for each species.

Abbreviations: AM – Australian Museum, Sydney; ANIC – Australian National Insect Collection, CSIRO, Canberra; BMNH – The Natural History Museum, London; MCZ – Museum of Comparative Zoology, Harvard University, Cambridge, USA; QM – Queensland Museum, Brisbane; PNG – Papua New Guinea; Qld – Queensland; FWL – forewing length.

PHILIRIS RÖBER, 1891

Philiris Röber, 1891: 317; Druce 1897: 14; Druce 1902: 115; Waterhouse 1903a: 650; Waterhouse 1903b: 188-189; Waterhouse 1913: 699; Waterhouse and Lyell 1914: 76; Waterhouse 1924: xxvii; Waterhouse 1932: 137; Waterhouse 1937: 115; Tite 1963: 222-225; Hemming 1967: 358; Tite 1969: 58; d'Abrera 1971: 368; McCubbin 1971: 72; Common and Waterhouse 1972: 424; Eliot 1973: 429; Sands 1979: 127; Sands 1981b: 89; Parsons 1998: 361-362; Edwards 1996: 250.

Parachrysops Bethune-Baker, 1904: 369; Hemming 1967: 338; d'Abrera 1971: 349; Eliot 1973: 429; Parsons 1998: 361; = *Philiris*: syn. Müller 2014: 34.

Type species *Thecla ilias* C. Felder, 1860: 454. Subfamily Theclinae, Tribe Luciini, *Hypochrysops* section (Eliot 1973).

Philiris diana Waterhouse & Lyell, 1914

(Figs 1-8, 53)

Philiris diana Waterhouse & Lyell, 1914: 76; Waterhouse 1932: 138; Edwards 1996: 250.

Philiris diana diana Waterhouse & Lyell: Wind and Clench 1947: 6; Tite 1963: 235; Common 1964: 124; d'Abrera 1971: 370; McCubbin 1971: 172; Common and Waterhouse 1972: 425; Braby 2000 and 2010; Orr and Kitching 2010: 236.

Types. Lectotype ♂ (here designated), QUEENSLAND: labelled 'Kuranda Qld, Mch 07 F.P. Dodd', 'G. Lyell collection', 'Type male PHILIRIS DIANA Waterhouse and Lyell KL21453', in AM. *Paralectotypes* (here designated): 7 ♂♂, 7 ♀♀, with same locality data as lectotype but with dates and registration numbers as follows: 4 ♂♂, April 1907, KL21456; 2 ♂♂, April 1907, KL21459; 1 ♂, March 1909, KL21458; 1 ♀, April 1907, KL21455; 2 ♀♀, April 1907, KL21456; 2 ♀♀, April 1908, KL21457; 1 ♀, April 1907, KL21459; 1 ♀, 16 April 1902, KL21454, with R.E. Turner instead of F.P. Dodd, all in AM. The Lectotype bears a red label and was listed as the holotype, in the handwriting of G.A. Waterhouse, in a register of specimens held in AM.

Diagnosis. Both sexes of *P. diana* were adequately described and illustrated by Waterhouse and Lyell (1914). The brownish purple upperside of males of *P. diana* is distinctively lighter and duller than the purple ground colour of *P. papuana kerri* subsp. n., previously considered to be a subspecies of *P. diana*,

and the white patch on the forewing of males of *P. diana*, referred to by Waterhouse (1932), is more prominent than the obscure white scales similarly placed on *P. papuana kerri*. Females of *P. diana* are very variable in the extent of white areas on the upperside of both wings but the greyish violet suffusion on both wings is much more restricted than in *P. papuana*. The pale greyish violet suffusion on the upperside of the forewings may be obscure or absent in *P. diana*.

The male genitalia of *P. diana* were figured by Tite (1963). The valvae are similar to those of *P. papuana kerri* but the curved apical projection on the right valva (posterior view) is shorter (Fig. 53) than that of *P. papuana* (Fig. 54) and the short projection on the right valva of *P. diana* is broad basally, rather than the subtubular projection of *P. papuana*.

Sands (1981a) proposed the *diana* species-group for *Philiris* species with relatively large adults in which both sexes are without a black spot on the inner margin of the hindwing underside and valvae of the male genitalia are asymmetrical. The *diana* species-group was subsequently accepted by Parsons (1998).

Variation. FWL: ♂♂, 15.3-16.4 mm; ♀♀, 16.7-18.6 mm. In males, the white patches on the dull purple forewing and the white hindwing costa are variable (Waterhouse 1932). The forewing median patch between the bases of M_3, CuA_1 and CuA_2 occasionally extends between CuA_2 and 1A+2A (Waterhouse and Lyell 1914, plate 15) and, on the hindwing, the white area on the costa may extend from Rs towards M_1. Females of *P. diana* vary in the extent of blue basal scales and white on the upperside of both wings; the central area of white on the forewing may be confined to the median and postmedian region or extend to the subterminal region or inner margin, while on the hindwing the white area may be limited to the costa or may extend to postmedian and subterminal regions between M_1 and M_3.

Distribution. Northern Queensland: Lake Eacham (Atherton Tableland), Kuranda, Cairns and Paluma.

Biology. A pupa was found near Kuranda on the upperside of a leaf of *Litsea* sp., possibly *L. leefeana* (F. Muell.) Merr. (Lauraceae) (Braby 2000), and this is a probable larval food plant for *P. diana*.

***Philiris papuana papuana* Wind & Clench, 1947, stat. n.**

(Figs 9-14)

Philiris diana papuanus Wind & Clench, 1947: 6; Tite 1963: 235; Kerr 1967: 49-51; d'Abrera 1971: 370; McCubbin 1971: 72; Common amd Waterhouse 1972: 425; Sands 1979: 131; Parsons 1998: 362; Edwards 1996: 250; Orr and Kitching 2010: 236.

Philiris diana: Parsons 1991: 136-137; misidentification.

Type. Holotype ♂, PAPUA NEW GUINEA: Wau, Morobe District, in MCZ.

Figs 9-14. *Philiris papuana papuana* Wind & Clench: (9-10) ♂♂, (11-14) ♀♀; (9, 11, 13) uppersides, (10, 12, 14) undersides. Localities: (9-10) Musgrave River, Central Province, PNG; (11-14) Madang, Madang Province, PNG.

Diagnosis. The description by Wind and Clench (1947) was based on a comparison of the type specimen from Papua New Guinea with figures of male *P. diana* in Waterhouse and Lyell (1914) and Waterhouse (1932). Parsons (1998) figured the adults of both sexes.

The male genitalia of *P. p. papuana* were figured by Tite (1963) and Parsons (1998); the asymmetrical valvae were noted by Tite (1963) and figured by Sands (1979). Tite (1963) compared the male genitalia of *P. p. papuana* with

those of *P. diana*, describing the former as 'larger and stouter' than those of *P. diana*.

Sands (1981a) and Parsons (1998) included *P. papuana* in the *diana* species-group proposed by Sands (1981a).

Variation. FWL: ♂♂, *ca* 16.0-18.3 mm; ♀♀, 16.0-19.0 mm. Males of *P. papuana papuana* show some variation in the area of obscure white scales on the forewing, whereas females vary in the extent of white on the costa and the distribution of blue scales on the hindwing. In localities in southern Papua New Guinea, females from higher altitudes have more extensive areas of blue on the hindwing than in specimens from near the coast. However, these blue areas in *P. p. papuana* are not as extensive as those in *P. p. kerri*.

Distribution. Mainland Papua New Guinea and Papua Province, eastern Indonesia.

Biology. In Papua New Guinea, Parsons (1998) located larvae of *P. papuana papuana* feeding on *Litsea guppyi* (F. Muell.) F. Muell. ex Forman (Lauraceae).

Philiris papuana kerri **subsp. n.**

(Figs 15-20, 54)

Philiris diana papuana: Kerr 1967: 49-51; d'Abrera 1971: 370; McCubbin 1971: 2; Common and Waterhouse 1972: 425; Sands 1979: 131, Braby 2010: 34-35, Orr and Kitching 2010: 236; misidentifications.

Types. *Holotype* ♂, QUEENSLAND: labelled 'Claudie River Nth. Qld. 26.xii.71, D.P. Sands', 'Figured in *Butterflies of Australia*, CSIRO Publishing, M.F. Braby', in ANIC. *Paratypes*: 1 ♂, Claudie River, 1 May 1966, J.F.R. Kerr; 1 ♀, same data with additional label 'Metallotype *Philiris diana papuana*'; 1 ♂, West Claudie River e.p., 30 August 1999, D.P.A. Sands; 1 ♂, Lockerbie Scrub, Cape York, 9 Oct 76, D. Sands, ANIC database No. 32, 043995, Barcode of Life DNA voucher specimen: 11ANIC-05827 BOLD Proc. ID ANIC1827-11; 1 ♂, near Mt Lamond, Iron Range, 11 April 1971, AA, all in ANIC; 1 ♀, ABRS Area 2, 142°45'E, 11°40'S, Dividing Range, 15 km. W. Captain Billy Creek, Cape York Pen., 5-12.ii.1976, G.B. Monteith, in QM; 1 ♂, West Claudie R, Iron Range, XP, 27.ix.2000, R Mayo; 1 ♂, West Claudie R, CYP, XP, 4.ix.1999, R Mayo; 1 ♂, Phillip Hill, Iron Range, XP, 2.x.2003, R Mayo; 1 ♂, West Claudie R, XP, 14.ix.2001, R Mayo; 1 ♀, West Claudie R, Iron Range, XP, 1.x.2000, R Mayo; 1 ♀, West Claudie R, Iron Range, XP, 2 x 2000, R Mayo; 1 ♀, West Claudie R, Iron Range, XP, 31.viii.2000, R Mayo; 1 ♀, Gordon Ck, Iron Range, 22.viii.2001, R Mayo, all in Russell Mayo Collection, Pomona, Qld.

Kerr (1967) described a female specimen as a metallotype of *P. papuana*; the same specimen is here designated a paratype of *P. p. kerri*.

Description. Male. Antennal length (of holotype) 9.0 mm, shaft black with narrow white segmental bands, club dorsally black, apex dorsally edged and ventrally orange; eyes dark grey, edged white; frons white; thorax and abdomen dorsally dark grey, ventrally white; palpus white, apical segment

grey; tibiae and tarsi white with narrow black bands. Forewing length (of holotype) 15.0 mm, termen almost straight; upperside mauve-purple, an obscure postmedian whitish suffusion from cell vein and between M_3 and CuA_2 to postmedian area; termen narrowly black (*ca* 0.2 mm) from apex to tornus; cilia from apex to CuA_2 grey and from CuA_2 to tornus narrowly white. Hindwing upperside mauve-purple, costa from base, $Sc+R_1$, Rs to apex, grey; termen narrowly (*ca* 0.2 mm) black, wider from CuA_1 to tornus (*ca* 0.4 mm); inner margin fold grey-white; cilia narrowly white. Underside of both wings silvery white, forewing with obscure greyish median patch between CuA_1 and CuA_2; termen white, narrowly tipped black at vein ends M_3 to tornus, hindwing broadly black at vein ends CuA_1, CuA_2 and 1A+2A; inner margin without black spot; cilia white, except black at vein ends CuA_1, CuA_2 and 1A+2A.

Male genitalia (Fig. 54). Unmounted: vinculum-tegumen ring narrowly oval in posterior view. Slide mounted: sociuncus and vinculum broad, saccus expanded, socii stout, separated by a shallow U-shaped sinus, margins straight, obtusely angled at 2/3 edge, clothed with fine setae; brachia stout, inwardly curved, apically broad, tip inwardly tapered to a point; valvae relatively long, curved, unequal in length (posterior view: left valva longer than right), both basally broad, cone-shaped, subtriangular, with mid section long, slender, apices expanded and shapes asymmetrical with fine setae, apex of left valva (posterior view) with outwardly curved, tapered, sharply pointed beak-shaped projection, apex of right valva (posterior view) blunt, with single peg-shaped projection; juxta subcylindrical, with sclerotised ring surrounding aedeagus; aedeagus subcylindrical, prezonal sheath broadened, retracted cornuti with two slender strips of finely sclerotised spines; anal tube slender, moderately sclerotised.

Female. Antennal length (of paratype) 9.0 mm, shaft black with narrow white segmental bands, club dorsally black, apically tipped orange, ventrally orange; eyes dark grey, edged white; frons grey-brown; palpus white, apical segment grey; thorax and abdomen dorsally dark grey, ventrally white; tibiae and tarsi white with black bands. Forewing length (of paratype) 16.7 mm, termen bowed, apex obtuse; upperside costa, apex, termen and tornus broadly dark grey; area from base to cell, to inner margin and postmedian area, pale blue-mauve; a subcentral white oval patch between bases of M_3, CuA_1 and CuA_2, extending to subtermen. Hindwing upperside with apical half of costa white with greyish suffusion extending to Rs and M_1; a broad area from base and cell to subtermen and subtornus pale blue-violet, crossed by dark grey veins except at the apical cell bar; termen dark grey-brown (*ca* 5.0 mm); cilia white. Underside of both wings silvery white, forewing with small obscure greyish patch in median region; termen white, narrowly black between CuA_1, CuA_2 and 1A+2A and black at vein ends M_3 to tornus; inner margin white (without black spot); cilia white, except black at vein ends CuA_1, CuA_2 and 1A+2A.

Figs 15-20. *Philiris papuana kerri* subsp. n.: (15-16) ♂♂, (17-20) ♀♀; (15, 17, 19) uppersides, (16, 18, 20) undersides. Localities: (15-16) West Claudie River, Qld; (17-20) Claudie River, Qld.

Variation. FWL: ♂♂, 14.7-16.8 mm; ♀♀, 16.7-19.7 mm. Males are variable in the density of white scales on the forewing but the upperside of both wings is otherwise similar to *P. p. papuana*. Females of *P. p. kerri* show little variation in colour of the upperside (Figs 17, 19) but occasionally the blue areas extend to the termen at M_1 of the hindwing.

Comments. Recognition of *P. papuana kerri* as a separate subspecies is based on morphological differences in both sexes. The upperside of males of both

subspecies is similar, but the wingspans of *P. p. kerri* are usually slightly smaller (FWL *ca* 15.00-17.20 mm) than those of *P. p. papuana* (FWL *ca* 16.00-18.30 mm). The variable and often obscure whitish suffusion on the upperside of the forewing of males is usually more prominent on *P. p. kerri* than on *P. p. papuana*, where it is sometimes absent, and the hindwing costa on the upperside of *P. p. kerri* is paler than in *P. p. papuana*. The grey subbasal suffusion on the forewing underside of males of the two subspecies differs, with the median patch between CuA_1 and CuA_2 of *P. p. papuana* more extensive than that of *P. p. kerri* and reaching the postmedian region. The hindwing underside termen of *P. p. kerri* is mostly white with only black cilia at the margin, whereas in *P. p. papuana* the termen is narrowly black. The male genitalia of *P. p. kerri* do not differ significantly from those of *P. p. papuana*, figured by Tite (1963).

Differences between females of *P. papuana* from Australia and Papua New Guinea were referred to by Sands (1979), who noted that the blue areas on both wings [of *P. p. kerri*] were more extensive (Figs 17, 19) when compared with females of *P. p. papuana* (Figs 11, 13) from New Guinea. The wingspans of females of *P. p. kerri* are similar (FWL 17.0-19.5 mm) to those of *P. p. papuana.* The extent of blue on the upperside of both wings differs: in *P. p. kerri* (figured by Kerr 1967) blue areas extend to the postmedian and inner margin of the forewing and the subterminal area of the hindwing, but in *P. p. papuana* blue areas are limited to the basal half of the forewing and postcellular region of the hindwing.

Etymology. Named in honour of Emeritus Professor J.F.R. Kerr, in recognition of his many contributions to the study of Australian butterflies.

Distribution. Cape York Peninsula, northern Queensland: Lockerbie Scrub, Captain Billy Creek, Claudie River and Iron Range.

Biology. The life history of *P. papuana kerri* was described by Wood (1984). On Cape York Peninsula, the larvae fed on *Litsea breviumbellata* C.K. Allen (Lauraceae) and are not attended by ants (Valentine and Johnson 1997). Males of *P. p. kerri* frequently settle on the upperside of leaves up to eight metres above ground level, on trees growing at the edge of rainforest or in clearings near streams.

Philiris fulgens fulgens (Grosse-Smith & Kirby, 1897)

Holochila fulgens Grose-Smith & Kirby, 1897: 8.

Candalides fulgens (Grose-Smith & Kirby): Grunberg in Seitz 1921: 854.

Philiris fulgens fulgens (Grose-Smith & Kirby): Wind and Clench 1947: 8; Tite 1963: 242, d'Abrera 1971: 372; Parsons 1998: 365.

Type. Lectotype ♂, INDONESIA: Amboina, Maluku, in BMNH. A male was described and illustrated by Grose-Smith and Kirby (1897) and the male referred to by Tite (1963) from Amboina (Ambon), bearing a Hewitson label, is probably one of the syntypes. This specimen was designated the Lectotype by Parsons (1998).

Male genitalia. Figured by Tite (1963) and Parsons (1991, 1998).

Distribution. Indonesia: Ambon. Other subspecies have been described from Aru, Biak, mainland New Guinea and Papua New Guinea islands.

***Philiris fulgens kurandae* Waterhouse, 1903**

(Figs 21-26, 55)

Philiris kurandae Waterhouse, 1903a: 651; Waterhouse 1903b: 189-190; Waterhouse and Lyell 1914: 76; Waterhouse 1932: 138; Barrett and Burns 1951: 147.

Philiris fulgens kurandae Waterhouse: Tite 1963: 242; Common 1964: 122; d'Abrera 1971: 372; Common and Waterhouse 1972: 426-427.

Philiris fulgens (Grose-Smith & Kirby): Edwards 1996: 250; Orr and Kitching 2010: 236.

Types. Lectotype ♂ (here designated), QUEENSLAND: labelled 'Kuranda N.Q. Apr. 1902, 24th R.E. Turner', '*Philiris kurandae*. G.A. Waterhouse, Type ♂ KL21421', 'G.A. Waterhouse collection', in AM. *Paralectotypes* (here designated): 4 ♂♂, 5 ♀♀, with same locality and collector as lectotype but with dates and registration numbers as follows: 4 ♂♂, 1 ♀, Dec. 1901-Jan. 1902, KL21426; 1 ♀, Dec. 1901, KL21422; 3 ♀♀, Mch-April 1902, KL21427, all in AM.

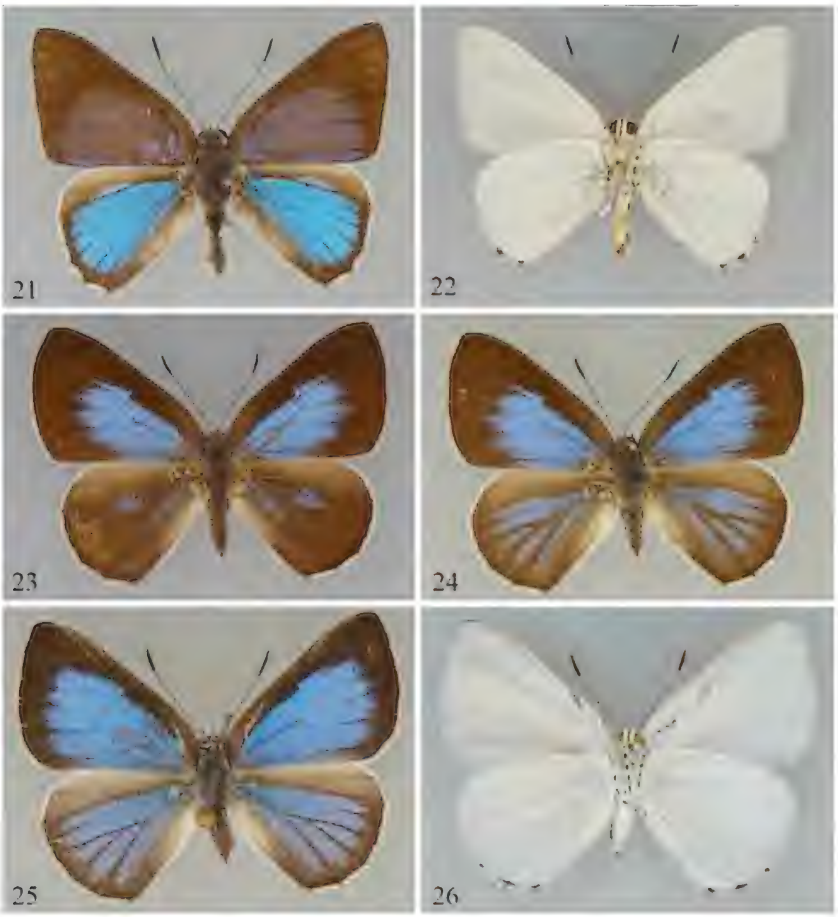
When referring to *Philiris kurandae* in a register of specimens at AM, G.A. Waterhouse noted: 'Types ♂♀ Kuranda in Australian Museum'. The male referred to in the Register as the 'HOLOTYPE MALE' is here designated as the Lectotype.

Diagnosis. FWL: ♂♂, 14.2-15.1 mm; ♀♀, 14.0-16.3 mm. In all geographical populations of *P. fulgens* the extent of variation in both sexes is considerable. It is difficult to distinguish the nominotypical *P. f. fulgens* from Amboina, Indonesia, *P. f. bicolorata* Wind & Clench from mainland New Guinea and *P. f. kurandae* from Queensland. Further morphological studies are needed to validate the subspecific names for *P. fulgens*.

The characteristic 'two-tone' colour of the upperside of males of *P. fulgens* – dull purple forewings and sky blue hindwings – is unusual for Lycaenidae from the Australian Region (Waterhouse 1932) and elsewhere, but this pattern also occurs in males of *Hypochrysops thesaurus* (Grose-Smith) from mainland New Guinea.

Sands (1981a) proposed a *fulgens* species-group for *P. fulgens* and related species, accepted by Parsons (1998). The species and subspecies included in this species-group require taxonomic reassessment and consideration of the related species from Papua New Guinea referred to by Parsons (1998).

Variation. FWL: ♂♂, 13.3-15.0 mm; ♀♀, 15.0-16.7 mm. In males, slight variation occurs in the width of the dull black apex of the forewing of *P. fulgens kurandae* and the black termen edging the blue hindwing may also vary in width. Females are most variable in the extent of dull blue on the upperside, with these areas often restricted to the base of the wings, reaching the cell or, occasionally, extending to most of the wing and the subterminal regions of both wings.



Figs 21-26. *Philiris fulgens kurandae* Waterhouse: (21-22) ♂♂, (23-26) ♀♀; (21, 23-25) uppersides, (22, 26) undersides. Localities: (21-22) Palmerston, Qld; (23) Alice River, Qld; (24) Palmerston, Qld; (25-26) Kuranda, Qld.

Distribution. Northern Queensland: Lockerbie Scrub, Claudie River, Alice River, Rocky River, Cooktown, Cape Tribulation, Cairns, Palmerston, Ingham, Innisfail, Mission Beach, Paluma, Bluewater State Forest.

Biology. Eggs are deposited on foliage of the food plants (Wood 1984) and larvae skeletonise leaves when feeding on the underside. Pupae are attached between the bases of leaf veins of the food plants, which include *Cryptocarya mackinnoniana* f. Muell., *C. murrayi* F. Muell., *Litsea breviumbellata* C.K. Allen, *L. leefeana* (F. Muell.) Merr. and *Endiandra hypotephra* F. Muell. (Lauraceae).

***Philiris ziska ziska* (Grose-Smith, 1898)**

(Figs 27-30)

Holochila ziska Grose-Smith, 1898: 11.

Candalides pratti Bethune-Baker, 1908: 122; syn. Tite 1963: 243.

Philiris ziska (Grose-Smith): Tite 1963: 243-244; Kerr 1967: 49.

Philiris ziska ziska (Grose-Smith): d'Abrera 1971: 373; Parsons 1998: 371.

Types. Holochila ziska: *Lectotype* ♂, designated by Parsons (1998), INDONESIA: labelled 'Type', 'Kapaur', 'Type HT, Ziska Gr.Sm. Kapaur. Types ♂♀', 'Gen. 1961-245 G.E.T.', with genitalia slide, in BMNH.

Male genitalia. Figured by Tite (1963) and Parsons (1998).

Variation. Males of *P. z. ziska* (FWL *ca* 14 mm) are larger than males of *P. z. titeus* (FWL *ca* 12 mm) and the hindwing costa on the upperside, whilst usually white (noted by Grose-Smith 1898), is very variable and sometimes light brown, rarely as prominently white as the costa of male *P. z. titeus*. Females of *P. z. ziska* are also larger than those of *P. z. titeus* and the upperside of both wings has much smaller areas of white than those of *P. z. titeus*. Grose-Smith's (1898) description of *Holochila ziska* refers to a male but the female he described as *P. ziska* is a female of another species (Tite 1963).

Distribution. Mainland Papua New Guinea; Papua Province and neighbouring islands of eastern Indonesia.

***Philiris ziska titeus* d'Abrera, 1971**

(Figs 31-34, 56)

Philiris ziska (Grose-Smith): Kerr 1967: 49; McCubbin 1971: 72; Common and Waterhouse 1972: 427; Orr and Kitching 2010: 237.

Philiris ziska titeus d'Abrera, 1971: 373; Edwards 1996: 250; Braby 2009: 119-121.

Types. Lectotype ♂, designated by Braby (2009), QUEENSLAND: labelled (as per Braby 2009) 'CLAUDIE R. CAPE YORK, 1 MAY 1966', 'Specimen photographed by B. D'Abrera, 1970', 'B.M. Reg. No. 1966-587', '253', 'Holotype', '*Philiris ziska titeus*, D'Abrera, det. R.I. Vane-Wright, HOLOTYPE ♂'. *Paralectotypes*: 1 ♂, labelled 'CLAUDIE R. CAPE YORK, 2 MAY 1966', 'Specimen photographed by B. D'Abrera, 1970', 'B.M. Reg. No. 1966-587'. '255', 'Paratype, '*Philiris ziska titeus*, D'Abrera, det. R.I. Vane-Wright, PARATYPE ♂'; 1 ♂, labelled 'CLAUDIE R. CAPE YORK, 2 MAY 1966', 'Specimen photographed by B. D'Abrera, 1970', 'B.M. Reg. No. 1966-587', '255', 'Paratype', '*Philiris ziska titeus*, D'Abrera, det. R.I. Vane-Wright, PARATYPE ♂'; 1 ♀, labelled 'CLAUDIE R. CAPE YORK, 3 MAY 1966', 'Specimen photographed by B. D'Abrera, 1970', 'B.M. Reg. No. 1966-587', '254', 'Paratype', '*Philiris ziska titeus*, D'Abrera, det. R.I. Vane-Wright, PARATYPE ♀'; 1 ♀, labelled 'CLAUDIE R. CAPE YORK, 26 APR. 1966', 'B.M. Reg. No. 1966-587' (types collected by J.F.R. Kerr), all in BMNH.

D'Abrera (1971) did not contrast *P. z. titeus* with the nominotypical *P. z. ziska* when describing the Australian subspecies.

Figs 27-34. *Philiris ziska* subspecies: (27-30) *P. z. ziska* (Grose-Smith), (31-34) *P. z. titeus* d'Abrera; (31, 32, 35, 36) ♂♂, (33, 34, 37, 38) ♀♀; (31, 33, 35, 37) uppersides, (32, 34, 36, 38) undersides. Localities: (27-28) Lae, Morobe Probvince, PNG; (29-30) Sogeri, Central Province, PNG; (31-32) Claudie River, Qld; (33-34) Rocky River, Qld.

Diagnosis. Males of *P. z. titeus* (FWL *ca* 12 mm) from Queensland are smaller than those of *P. z. ziska* (FWL *ca* 14 mm) from Papua New Guinea, and the upperside of the hindwing costa of *P. z. titeus* is more broadly white than in *P. z. ziska*. The shining purple-blue ground colour of *P. z. ziska* and *P. z. titeus* and width of the black apex are similar. Median white scales on the forewing upperside of males of *P. z. titeus* may be absent, obscure or occasionally prominent (the late Murdoch De Baar pers. comm.) and, when present, more noticeable than in *P. z. ziska*. The male genitalia of *P. z. titeus* (Fig. 56) are similar to those of *P. z. ziska* but the characteristic projection from the valva is more rounded in *P. z. titeus*, the median sociuncus lobes are more produced and the aedeagus is longer and narrower. When compared with *P. azula johnsoni*, the purple-blue ground colour of male *P. z. titeus* is brighter than the dull violet-blue of *P. azula johnsoni* and the black forewing apex of *P. z. titeus* is narrower. The hindwing costa of *P. z. titeus* is white, whereas that of *P. azula johnsoni* is light brown.

Females of *P. z. titeus* (FWL *ca* 13 mm) are smaller than *P. z. ziska* (FWL *ca* 15 mm) and the areas of white are more extensive, often merging with greenish blue scales on the forewing, whereas on the hindwing of *P. z. ziska* the white area rarely extends beyond Rs. Females of *P. z. titeus* are very similar to those of *P. lucina* but may be distinguished by the position of the white area on the hindwing, that of *P. z. titeus* extending from the base to the postmedian region of M_3. Moreover, in *P. z. titeus* the white area near the base and from the costa to the cell often extends beyond the postmedian region, whereas in *P. lucina* the white area (although variable) is absent from the grey-black subbasal area of the wing and extends from beyond the cell to the postmedian region.

Sands (1981a) proposed a *ziska* species-group for *P. ziska* and related species. This proposal was subsequently accepted by Parsons (1998).

Variation. FWL: ♂♂, 12.2-14.0 mm; ♀♀, 12.3-13.7 mm. The median areas of white scales on the forewing upperside of males of *P. z. titeus* may be absent (resembling *P. z. ziska*), obscure or, occasionally, prominent (Samson and Johnson 2009) and located post-cell between the bases of M_1, M_2 and CuA_1 and rarely reaching the subterminal region. The white costa of the hindwing may also vary in width, sometimes extending from the wing base to the base of M_1 at the apex of the cell.

Distribution. Cape York Peninsula, northern Queensland: Iron Range, Claudie River and Rocky River.

Biology. The life history of *P. z. titeus,* described by Samson and Johnson (2009), is very similar to that of nominotypical *P. z. ziska* from Papua New Guinea (Parsons 1984). Larvae feed on the vine *Trophis scandens* (Lour.) Hook. & Arn. (Samson and Johnson 2009); they are not attended by ants. Pupation takes place under the base of leaves of the food plant.

Philiris azula azula Wind & Clench, 1947

(Figs 35-38)

Philiris azula Wind & Clench, 1947: 8-9; Tite 1963: 241; Parsons 1998: 371; Edwards 1996: 250.

Type. Holotype ♂, PAPUA NEW GUINEA: Wau, Morobe District, in MCZ.

Diagnosis. The pale, greyish blue colour of males of *P. azula azula* is distinctive and not seen in other *Philiris* spp. of similar wingspan from Papua New Guinea. The females of *P. a. azula* are similar to several other female *Philiris* spp. from Papua New Guinea, but the upperside is much darker than the single known female of *P. a. johnsoni* from Australia. The hindwing costa of females of *P. z. ziska* is usually prominently white, when compared with the greyish white costa of females of *P. azula azula*.

Sands (1981a) proposed that *P. azula* be included in a *ziska* species-group together with other related species. This was subsequently accepted by Parsons (1998).

Figs 35-38. *Philiris azula azula* Wind & Clench: (35-36) ♂♂, (37-38) ♀♀; (35, 37) uppersides, (36, 38) undersides. Localities: (35-36) Lae, Morobe Province, PNG; (37-38) Wau, Morobe Province, PNG.

Variation. FWL: ♂♂, 15.0-15.5 mm; ♀♀, 14.5-16.0 mm. In males of *P. a. azula* the width of the black apex on the upperside may vary slightly.

Females also vary slightly and may be similar to those of several other *Philiris* spp. from Papua New Guinea, including *P. ziska ziska*.

Distribution. Mainland Papua New Guinea and Papua Province, eastern Indonesia.

Biology. The life history of *P. a. azula* is not recorded. Adult females were observed near Lae, Morobe Province, Papua New Guinea, resting on foliage of *Streblus brunonianus* (Endl.) F.Muell. (Moraceae), but it is not known if this is a food plant for the larvae of of *P. a. azula*.

Philiris azula johnsoni **subsp. n.**

(Figs 39-44, 57)

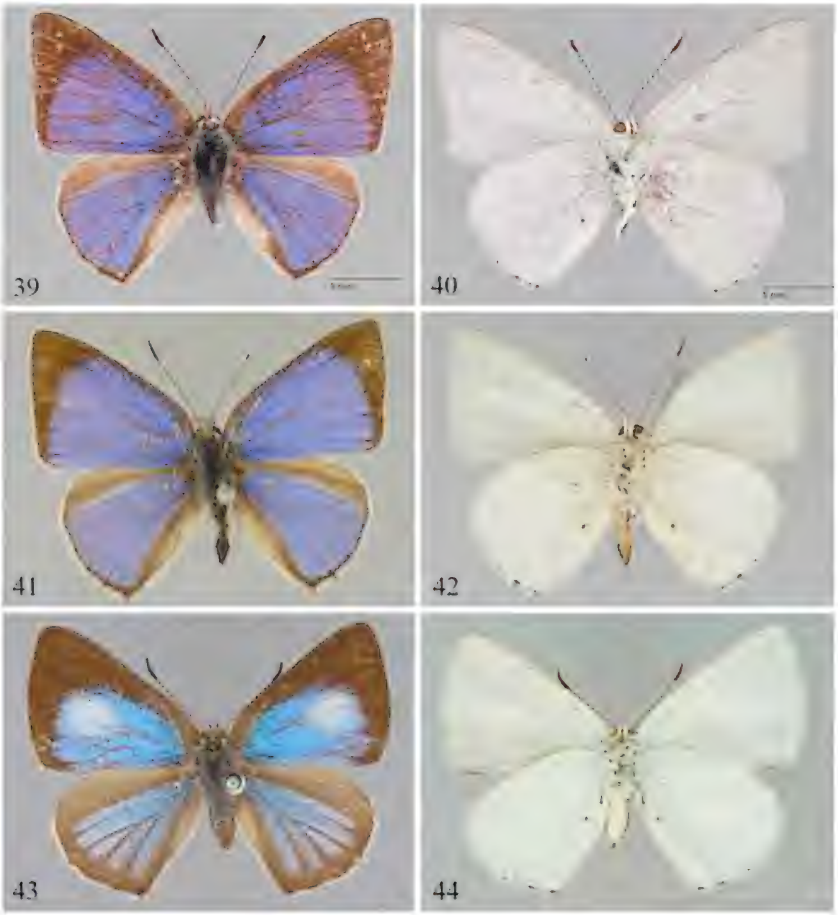
Philiris azula Wind & Clench: Johnson and Johnson 1984: 89-90.

Types. *Holotype* ♂, QUEENSLAND: labelled 'Gordon Creek, Iron Range Qld, 1-10.vii.1981, I.R. & A.J. Johnson', 'Figured in *Butterflies of Australia* (1999), CSIRO Publishing, M.F. Braby', 'Photog. Spm PS 2130', 'GENITALIA SLIDE No. 042', in QM. *Paratypes*: 1 ♀, labelled 'Mt. White Summit, Coen, N. Qld, 6 July 1976, G.B. & S.R. Monteith', in QM; 1 ♂, labelled 'Iron Range, Gordon Creek, 15-6-90, Bill Graham', in ANIC.

Description. *Male*. Antenna length (of holotype) 7.4 mm, shaft black with segmental bands white, club black, tipped orange dorsally, orange 2/3 apically; eyes brown, edged with white cilia; frons white; thorax and abdomen dorsally dark grey-black, ventrally white; palpus white, apical segment light brown; tibiae white with brown bands at apex of segment, tarsi banded white and brown. Forewing length (of holotype) 13.4 mm, apex acute, termen and inner margin almost straight; upperside base to subtermen and inner margin dull violet-blue, apex broadly brown-black to *ca* 1/3 forewing of costa; termen brown-black, broad at apex, narrower at tornus; cilia from apex to CuA_1 brown, CuA_1 to tornus narrowly white. Hindwing upperside dull violet-blue from base to median region and subtornus; costa, Rs and apex light brown; base of inner marginal fold light brown, dark brown towards tornus; termen narrowly dark brown, broader CuA_2 to tornus; Underside both wings silvery white, forewing unmarked except brown vein ends at termen; hindwing inner margin with brown-black spot on inner margin; termen white with brown flecks at vein ends CuA_1, CuA_2 and 1A+2A.

Male genitalia. Unmounted: vinculum-tegumen ring oval in posterior view. Slide mounted: sociuncus and vinculum narrow, saccus expanded, socii tapered with pointed median lobes, separated by a deep U-shaped sinus, margins weakly convex, clothed with fine setae; brachia slender, inwardly curved, apically more slender, tip inwardly tapered to a blunt point; valvae almost symmetrical, subtriangular, longer than wide with blunt subsquared apices, clothed apically with fine setae; juxta slender, subcylindrical, with slerotised ring surrounding aedeagus; aedeagus subcylindrical, prezonal

sheath broadly expanded anteriorly, postzonal sheath with retracted cornuti with two groups of finely sclerotised spines; anal tube slender, weakly sclerotised. The male genitalia were also figured by Johnson and Johnson (1984).



Figs 39-44. *Philiris azula johnsoni* Sands: (39-42) ♂♂, (43-44) ♀♀; (39, 41, 43) uppersides, (40, 42, 44) undersides. Localities: (39-42) Gordon Creek, Iron Range, Qld; (43-44) Mount White, Coen, Qld.

Female. Antennal length (of paratype) 7.3 mm, shaft grey-black with narrow white segmental bands, club dorsally dark brown-black, apically tipped orange-brown, orange 2/3 apically; eyes grey-brown edged white; frons grey-brown, edged white; palpus dorsally brown, ventrally white; thorax and abdomen dorsally light grey with long grey setae, ventrally white; tibiae and

tarsi white, broadly banded brown. Forewing length (of paratype) 14.5 mm, termen bowed, apex obtuse; upperside costa, apex, termen and tornus broadly grey-brown; area from base to cell, to inner margin and postmedian, light silvery blue; a subcentral white oval patch between bases of M_3, CuA_1 and CuA_2, extending to subtermen. Hindwing upperside with apical half of costa white and with greyish brown suffusion extending from apex to M_1; an area from base and cell to subtermen and subtornus pale blue-violet, greyish towards termen, crossed by dark grey veins; termen bowed, broadly (*ca* 1.5 mm) dark grey-brown; cilia white. Underside both wings silvery white; forewing with small obscure greyish patch in median region, termen and cilia white; hindwing white, inner margin with prominent submedian black spot; cilia white, except black at vein ends CuA_1, CuA_2 and 1A+2A.

Comments. The distinctive, weakly iridescent, lilac-blue colour on the upperside of both wings of *P. a. johnsoni* males distinguishes it from other Australian *Philiris* spp. When males of *P. a. johnsoni* are compared with *P. z. ziska*, the forewings of *P. a. johnsoni* are slightly narrower and the dark apex and termen is broader. The male genitalia of *P. a. johnsoni* do not differ significantly from those of nominotypical *P. a. azula*. Identification of the female specimen as a paratype of *P. a. johnsoni* is based on the antennae and the presence of a black spot on the underside of the inner margin of the hindwing. On the upperside, *P. a. johnsoni* differs from females of most other Australian *Philiris* spp. by the forewing white patch and more extensive areas of pale blue on both wings. The distribution of white and blue areas on the upperside resembles that of a small female of *P. papuana kerri,* but the shade of blue is different, the hindwing costa is grey rather than white and the black spot on the inner margin of the underside of the hindwing on *P. azula johnsoni* distinguishes it from *P. papuana kerri*, a species in which the underside hindwing spot is always absent.

Etymology. Named in honour of Stephen Johnson, in recognition of his many contributions to the study of Australian butterflies, especially in northern Qld.

Distribution. Cape York Peninsula, northern Qld: Iron Range, Claudie River and Coen. Only two males and one female have been collected to date.

Biology. The life history and food plant(s) of *P. a. johnsoni* are unknown.

***Philiris innotata* (Miskin, 1874)**

(Figs 45-52, 58)

Philiris ilias Felder, 1860: Waterhouse 1903b: 652; misidentification.

Pseudodipsas innotatus Miskin, 1874: 165.

Philiris ilias innotatus (Miskin): Waterhouse and Lyell 1914: 76; Waterhouse 1932: 137; Waterhouse 1937: 115.

Philiris innotatus evinculis Wind & Clench, 1947: 11; **syn. n**.

Philiris innotatus innotatus (Miskin): Tite 1962: 247; Common 1964: 124; McCubbin 1971: 72; d'Abrera 1971: 374.

Philiris innotatus evinculis Wind & Clench: Tite 1963: 248; Common 1964: 124; d'Abrera 1971: 374; McCubbin 1971: 72; Common and Waterhouse 1972: 428; Edwards 1996: 250.

Philiris innotata innotata (Miskin): Common and Waterhouse 1972: 427-428.

Philiris innotatus (Miskin): Edwards 1996: 250; Braby 2000: 683.

Philiris innotata (Miskin): Parsons 1998: 375-376; Orr and Kitching 2010: 236.

Types. Philiris innotata: Miskin's syntypes of *Pseudodipsas innotatus* from Brisbane have not been located (Hancock 1995) and specimens lodged in the Queensland Museum are not part of the syntypic series (S. Wright pers. comm.). In a register of specimens at AM, G.A. Waterhouse noted, when referring to *Philiris ilias*: 'Types ♂♀ Brisbane in Miskin Coll, Queensland Museum'. G.A. Waterhouse examined most of Miskin's types in July, 1910 (unpublished records, Australian Museum, Sydney; Hancock 1995) and referred to two males and one female of *Philiris innotata* but did not attach any labels to these specimens.

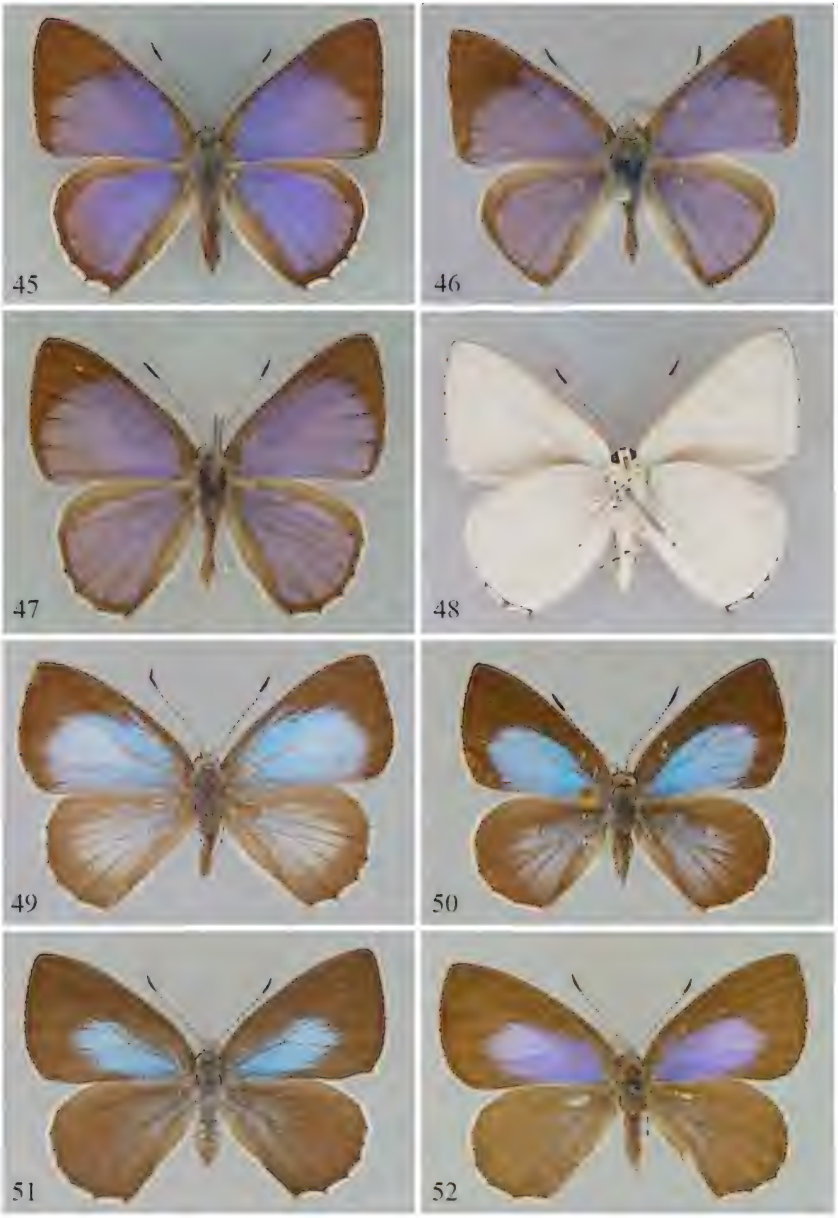
Philiris innotatus evinculis: *Holotype* ♂, QUEENSLAND: labelled 'Redlynch, North Queensland, Australia, August 14, 1938 (R.G. Wind)'; *allotype* ♀ with same locality and collector but September 17, 1938; 2 *paratype* ♂♂, 1 *paratype* ♀, same locality and collector but dated October 1, 1938, October 3, 1938 and August 14, 1938 respectively. Holotype, allotype and one paratype ♂ in Cornell University collection, one paratype ♂, one paratype ♀ in collection of R.G. Wind, Berkeley, California.

Diagnosis. The description of both sexes of *P. innotata* by Miskin (1874) was adequate and the male genitalia were figured by Tite (1963).

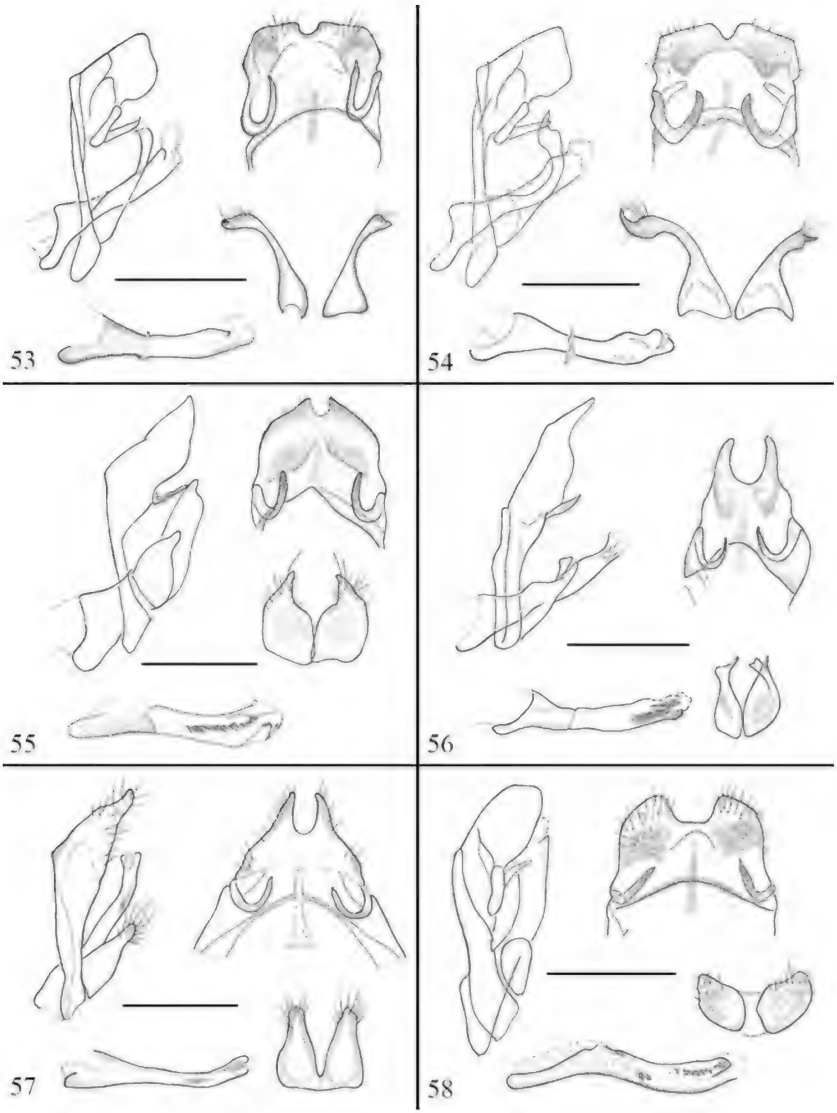
Both sexes of *P. i. evinculis* were described from specimens collected at Redlynch, Cairns, by R. G. Wind (Wind and Clench 1947). However, consistent differences (in colour and width of termen) between males from Cairns, Townsville and Magnetic Island, and those from Brisbane, are insufficiently distinct to justify separate subspecific rank. Not recognised as distinct in recent literature (and informally listed in synonymy by Braby 2010), *P. i. evinculis* is here formally synonymised with *P. i. innotata*.

Sands (1981a) proposed the *innotata* species-group to include several related species and this was subsequently accepted by Parsons (1998).

Variation. FWL: ♂♂, 11.7-13.5 mm; ♀♀, 11.7-14.2 mm. Males of *P. innotata* from Brisbane to Cooktown are variable in wingspan, shape of the forewing, extent of purple on the upperside and width of the black termen at the apex of the forewing. Males of *P. innotata* from the Claudie River are mostly smaller than those from Cairns and Townsville, the apex of the forewing is often more acute and the termen almost straight. In females, the extent of blue on the upperside of both wings is very variable and sometimes absent from the hindwing. When the blue area is extensive on the forewing, the veins of the forewing are sometimes white. Some females from northern inland Queensland have the most extensive areas of blue on both wings, possibly a result of extremes in temperature experienced during immature development.



Figs 45-52. *Philiris innotata* (Miskin): (45-48) ♂♂, (49-52) ♀♀; (45-47, 49-52) uppersides, (48) underside. Localities: (45, 48-50) Innot Hot Springs, Qld; (46) Coen River, Qld; (47) Brisbane, Qld; (51) Davies Creek, Qld; (52) Burleigh, Qld.



Figs 53-58. *Philiris* spp., male genitalia: (53) *P. diana* Waterhouse & Lyell; (54) *P. papuana kerri* Sands; (55) *P. fulgens kurandae* Waterhouse & Lyell; (56) *P. ziska titeus* d'Abrera; (57) *P. azula johnsoni* Sands; (58) *P. innotata* (Miskin). Images clockwise: lateral view, unmounted; slide mounted, posterior view, sociuncus, valvae & aedeagus. Scale bar = *ca* 1 mm for each species.

Distribution. Queensland: Cape York, Portland Roads, Claudie River, Coen River, McIlwraith Range, Cooktown, Cairns, Kuranda, Townsville, Magnetic Island, Great Palm Island, Mackay, Rockhampton, Gayndah, Maryborough, Kin Kin, Brisbane, Mt Tamborine, Burleigh Heads; New South Wales: Richmond River, Coffs Harbour, Port Macquarie. An undescribed subspecies of *P. innotata* has been recorded from the Eastern and Western Highlands of Papua New Guinea (Sands and Fenner 1978, Parsons 1998).

Biology. The life history is well known and the larval food plants are mostly sandpaper figs (*Ficus* spp: Moraceae), including *F. coronata* Spin, *F. fraseri* Miq. and *F. opposita* Miq. Larvae also feed on introduced figs, including the Indian *F. benghalensis* L. and Asian *F. carica* L. The feeding patterns produced by larvae of *P. innotata* on *Ficus* are distinctive and similar to those of several other *Philiris* spp. on other food plants, including *P. intensa* Butler in Papua New Guinea (Parsons 1998). In subtropical eastern Australia, larvae frequently compete for suitable leaves with larvae of the chrysomelid beetle *Ponerida semipullata* (Clark) (Sands and House 1990). In some areas, such as Magnetic Island and near Brisbane, the abundance of *P. innotata* may increase locally if the exotic *F. benghalensis* has been cultivated and where competitive herbivory by the larvae of *Ponerida semipullata* is absent.

Philiris nitens (Grose-Smith, 1898)

(Figs 59-66, 73)

Holochila nitens Grose-Smith, 1898: 107.

Philiris kamerungae Waterhouse, 1903a: 650; Waterhouse 1903b: 189; syn. Sands 1980: 82.

Philiris nitens (Grose-Smith): Waterhouse 1903b: 190; Edwards 1996: 250, Braby 2010: 34; Orr and Kitching 2010: 237.

Philiris kamerungae kamerungae Waterhouse: Waterhouse and Lyell 1914: 77; Waterhouse 1932: 137; Tite 1963: 240; Common 1964: 124; d'Abrera 1971: 372; McCubbin 1971: 72; Common and Waterhouse 1972: 425.

Candalides kamerungae (Waterhouse): Grunberg in Seitz 1921: 853.

Philiris nitens nitens (Grose-Smith): Tite 1963: 240; Common and Waterhouse 1972: 426; Sands 1980: 82.

Philiris nitens restricta Tite, 1963: 241; Common and Waterhouse 1972: 426; syn. Sands 1980: 82.

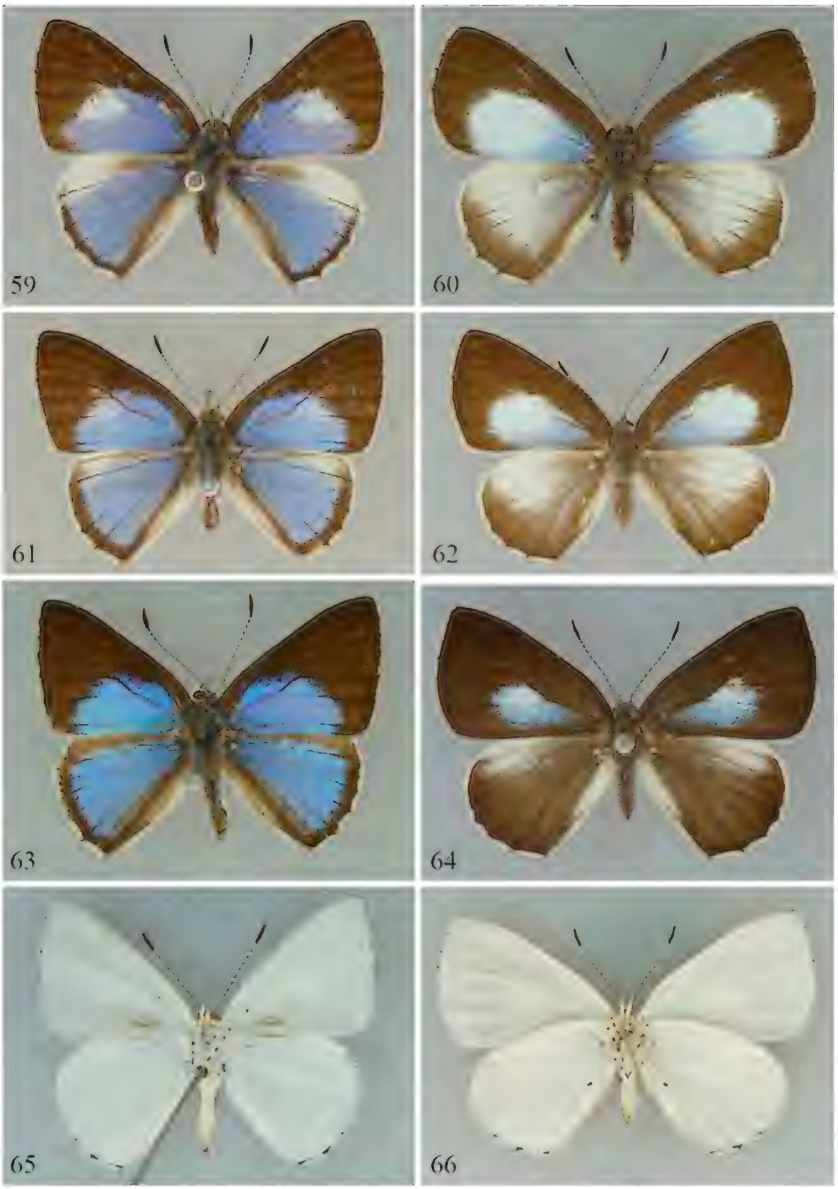
Types. Holochila nitens: *Holotype* ♂, QUEENSLAND: labelled '*nitens* Grose-Smith Type ♂', 'N. Queensld.', 'Gen. 1962. 436. G.E.T.', 'Rothschild bequest BMNH 1939-I' with genitalia slide, in BMNH.

Philiris kamerungae: *Lectotype* ♂ (designated by Peters (1971) 'by inference of holotype'), QUEENSLAND: labelled 'Kuranda, N.Q., Mar. 1902, R.E. Turner', '*Philiris kamerungae* type ♂, G.A. Waterhouse, KL21485', in AM. This specimen bears a red label and was listed as the holotype, in the handwriting of G.A. Waterhouse, in a register of specimens at AM. It was also listed as the holotype by Peters (1971) in his catalogue of types in the Australian Museum.

Philiris nitens restricta: *Holotype* ♂, QUEENSLAND: labelled 'Cedar Bay, S. of Cooktown (Meek)', 'Rothschild bequest BM. 1939-1', 'Gen. 1962 440. G.E.T.', 'Type HT', '*Philiris nitens restricta* Tite, Holotype ♂, BMNH Type No. RL 16843'with genitalia slide; *allotype* ♀, labelled 'Cedar Bay, S. of Cooktown (Meek)', 'Type AT', '*Philiris nitens restricta* Tite', 'ALLOTYPE ♀', 'BM Type No. RL. 16844', both in BMNH.

Diagnosis. The wingspans of males of *P. nitens* (FWL *ca* 12 mm) are similar to those of *P. sappheira manskiei* (FWL *ca* 12.5 mm) but slightly greater than those of *P. lucina* (FWL 11.5 mm). In both sexes the ventral surface of the antennal club of *P. nitens* is weakly tipped orange, but in *P. sappheira manskiei* and *P. lucina* the ventral apical half of the club is orange. Males of *P. nitens* can be distinguished from males of *P. sappheira manskiei* by the blue to purple-blue upperside areas, while the forewings are narrower and the hindwings weakly bowed; in males of *P. sappheira manskiei* the upperside areas are always bluish green, the forewings broader and the hindwings more rounded than in *P. nitens*. The blue areas of *P. nitens* males are also more extensive than the blue-green areas of *P. sappheira manskiei* males. The upperside of both fore and hindwings in male and female *P. nitens* usually have areas of white, unlike both sexes of *P. sappheira manskiei*, which are without any areas of white on the upperside. However, when areas of white are occasionally absent in males of *P. nitens*, the costa of the hindwing has whitish suffusions (Ring and Olive 1997) that are absent in *P. sappheira manskiei*. The hindwing black terminal band of *P. nitens* is subparallel to the termen, but in *P. sappheira manskiei* this band extends from the costa and from Rs to 1A+2A. The upperside of females of *P. nitens* has variable areas of white that are not present on the upperside of females of *P. sappheira manskiei.*

Areas of white on both fore and hindwings of *P. nitens* and *P. lucina* are often similar in the two species (Common and Waterhouse 1972) and females may be difficult to distinguish. Males of *P. nitens* can be distinguished from *P. lucina* by the darker blue or purple-blue areas on both wings in *P. nitens*, compared with the paler sky-blue areas on both wings in *P. lucina.* The forewing of males of *P. nitens* usually, but not always, has a suffusion of white scales or a prominent oval patch of white scales beyond the cell between the bases of M_3 and CuA_1, whereas in males of *P. lucina* there is a narrow strip of white scales from the bases of Rs and M_1 between cell and tornus and below CuA_1. On the hindwing of *P. nitens* males, the clear purple-blue area is bounded by a narrow grey-black terminal band, with or without a variable white area extending from mid costa to the apex and occasionally the termen at M_1, whereas in males of *P. lucina* the greenish blue area is crossed by dark veins. The grey-black terminal band of *P. lucina* is broad from Rs to the tornus, as well as on the apical half of the inner margin between 1A+2A. The basal half of the inner marginal fold of *P. lucina* is more prominent and more broadly white than that of *P. nitens*.



Figs 59-66. *Philiris nitens* (Grose-Smith): (59, 61, 63, 65) ♂♂, (60, 62, 64, 66) ♀♀; (59-64) uppersides, (65-66) undersides. Localities: (59) Bloomfield, Qld; (60-61) Kuranda, Qld; (63, 65) Innisfail, Qld; (64) Cairns, Qld; (62, 66) Josephine Falls, Qld.

In females of *P. lucina* the postmedian areas of white on the hindwing are crossed by dark postcellular veins, whereas the veins of *P. nitens* are not prominently darker than the ground colour. A darker apical cell bar on the hindwing of *P. lucina* at the bases of M_1, M_2 and M_3 assists in distinguishing females of *P. lucina* from those of *P. nitens*. Sands (1981a) proposed a *nitens* species-group to include *P. nitens* and related species, subsequently accepted by Parsons (1998). The male genitalia were figured by Tite (1963).

Variation. FWL: ♂♂, 12.2-13.0 mm; ♀♀, 12.3-14.8 mm. Males and females of *P. nitens* vary considerably in the extent of areas of white on the upperside of both fore and hindwings, due in part to seasonal effects and the temperatures experienced during immature development. For example, a female of *P. nitens* reared in Brisbane in June (Fig. 60) has much more extensive areas of white than specimens reared or collected during warmer months (J.F.R. Kerr pers. comm.). In males, the pale blue forewing usually has a variable small white median patch between the bases of M_3, CuA_1 and CuA_2, but the forewing is occasionally entirely pale blue or dark blue, without any areas of white. On the hindwing, the white costa of males also varies in extent and may be just visible or extend as far as M_1.

Distribution. Northern Queensland, from near Cooktown south to Bluewater Range, 24 km north of Townsville: 19 km S. of Cooktown (Ring and Olive 1997), Cedar Bay, Rossville, Mossman Gorge, Kuranda, Lake Placid, Cairns, Mission Beach, Innisfail, Herbert River, Ingham, Kirrama, Paluma, Mutarnee, Bluewater Range.

Biology. Larvae feed on *Macaranga involucrata* var. *mallotoides* (F. Muell.) L.M. Perry, and occasionally *Glochidion phillipicum* (Cav.) C.B. Rob. (Common and Waterhouse 1981) and *Macaranga tanarius* (L.) Muell. Arg. (L. Ring).

***Philiris lucina* Waterhouse & Lyell, 1913, stat. n.**

(Figs 67-72, 74)

Philiris kamerungae lucina Waterhouse & Lyell, 1914: 77; Waterhouse 1932: 138; Tite 1963: 240; Common 1964: 124; d'Abrera 1971: 372; McCubbin 1971: 72; Common and Waterhouse 1972: 425.

Philiris nitens lucina: Common and Waterhouse 1981: 464; Edwards 1996: 250, Braby 2010: 34.

Types. Lectotype ♂ (here designated), QUEENSLAND: labelled 'Cape York, 18 JLY 1910, H. Elgner', 'KL21517', 'G.A. Waterhouse collection'. *Paralectotypes* (here designated): 1 ♂, labelled 'Cape York, H. Elgner', 'KL21520'; 1 ♀, labelled 'Cape York, 22 Oct 1908, H. EIgner', 'Cape York, Q. 3:3:08, G.A. Waterhouse Coll. EIgner', and 'KL21518'; 1 ♀, labelled 'Cape York, 22 Oct 1908, H. EIgner', and 'KL21518'; 1 ♀, labelled 'Cape York, 3.8.10, H. EIgner', 'KL21521', all in AM.

The Lectotype, here designated, was listed as the holotype, in the handwriting of G.A. Waterhouse, in a register of specimens at AM.

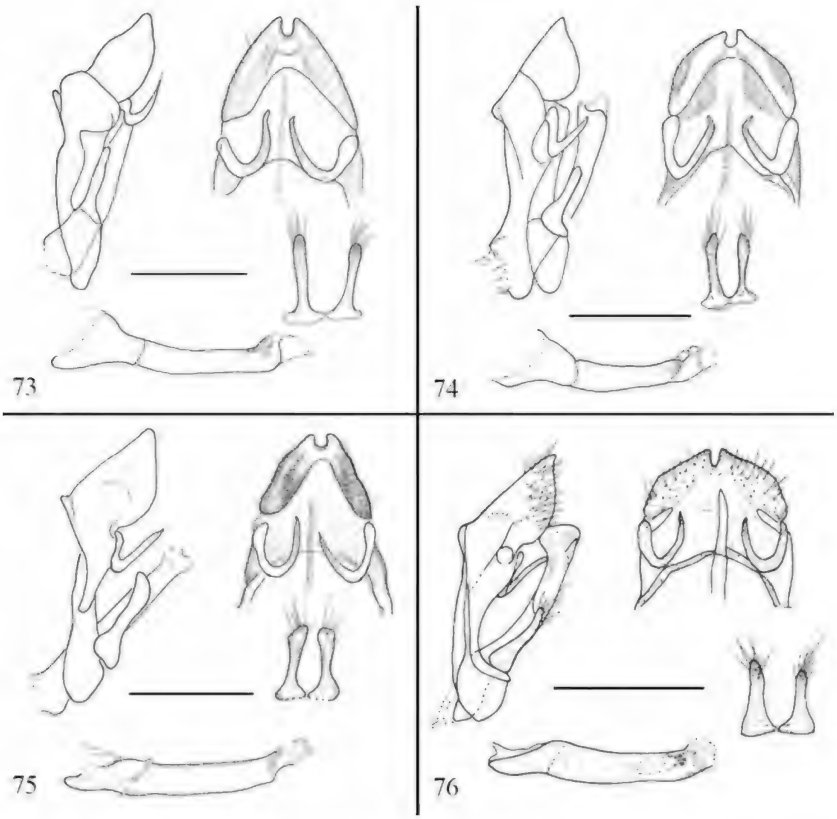
Figs 67-72. *Philiris lucina* Waterhouse & Lyell: (67, 69, 71) ♂♂, (68, 70, 72) ♀♀; (67-70) uppersides, (71-72) undersides. Localities: (67-69, 71) Claudie River, Qld; (70, 72) Iron Range, Qld.

Diagnosis. The pale shining blue areas and white patches on the upperside of males of *P. lucina* are somewhat similar to those of *P. scintillata* Sands from Papua New Guinea, but the wingspan of *P. lucina* is smaller and the male genitalia differ considerably from those of *P. scintillata* (Sands 1981b). When males of *P. nitens* are without white on the upperside, they may be similar to *P. sappheira manskiei* but are blue rather than blue-green. *Philiris lucina* can be distinguished from *P. nitens* by the more extensive orange on

the ventral surface of the antennal club and by the shorter valvae of the genitalia.

Females of *P. lucina* and *P. nitens* are readily distinguished from *P. sappheira manski* by the presence of white areas on the upperside of both species. In females of *P. sappheira manski* both wings have variable blue-green areas and are without the white areas that are always present in females of *P. lucina* and *P. nitens*.

The male genitalia of *P. lucina* (Fig. 74) and *P. nitens* (Figs 73) are readily distinguished from those of *P. sappheira manskiei* (Fig. 75) by the length and shape of the valvae (Ring and Olive 1997).



Figs 73-76. *Philiris* spp., male genitalia: (73) *P. nitens* Waterhouse & Lyell; (74) *P. lucina* Waterhouse & Lyell; (75) *P. sappheira manskiei* Ring & Olive; (76) *P. sappheira sappheira* Sands. Images clockwise: lateral view, unmounted; slide mounted, posterior view, sociuncus, valvae & aedeagus. Scale bar = *ca* 1 mm for each species.

Variation. FWL: ♂♂, 10.8-11.4 mm; ♀♀, 10.8-12.4 mm. In males, the extent of pale shining blue areas and white patches is variable and in females, on the hindwing, the extent of white may be restricted to the costa or extend almost to the apex.

Distribution. Cape York Peninsula, northern Queensland: Bamaga and Iron Range to the Rocky River. *Philiris lucina* is most abundant near Heathlands and near the Claudie River. *Philiris lucina*, *P. nitens* and *P. sappheira manskiei* are allopatric in distribution.

Biology. Larvae of *P. lucina* feed on *Macaranga involucrata* (Ring and Olive 1997). The life history is otherwise very similar to that of *P. nitens*.

***Philiris sappheira sappheira* Sands, 1980**

(Figs 76, 83)

Philiris nitens sappheira Sands, 1980: 82.

Philiris sappheira sappheira Sands: Ring and Olive 1997: 65; Orr and Kitching 2010: 236.

Type. Holotype ♂, PAPUA NEW GUINEA: Rouna Falls, Central Province, in ANIC.

Male genitalia (Fig. 76). Very similar to those of *P. s. manskiei* from northern Queensland but the valvae are not as prominently 'club-shaped' as in *P. s. manskiei*.

Variation. FWL: ♂♂, 12.5 mm; ♀, 13.5 mm. Males of *P. sappheira* may be distinguished from other species of similar size in the *nitens* species-group by the distinctive greenish blue areas and the absence of white on the upperside of both wings. Only one female (a paratype) of *P. s. sappheira* is known and confirmation of its identity will require more material, preferably when females are reared with males and confirmed to be conspecific, or by using DNA methods capable of discriminating closely-related taxa.

Distribution. Known from only the southern end of the Kokoda Track, Sogeri Plateau and Rouna Falls, Central Province, Papua New Guinea.

Biology. Unknown. Adults were collected near the embankments of shallow watercourses where a *Macaranga* sp. was abundant.

***Philiris sappheira manskiei* Ring & Olive, 1997**

(Figs 75, 77-82, 84)

Philiris sappheira manskiei Ring & Olive, 1997: 66-71; Braby 2010: 34; Orr and Kitching 2010: 236.

Types. Holotype ♂, QUEENSLAND: labelled 'McIvor River Road, 11 May 1994, L.R. Ring, xp *M. involucrata*', 'HOLOTYPE *Philiris sappheira manskiei*', 'ANIC Type Reg. No. 3330, genitalia slide No 3438', 'GART Exemplar und Etik-ketten dokumentiert specimen and label data documented 22.3.2002', + pupal shell on point, in ANIC.

Figs 77-84. *Philiris sappheira* subspecies: (83) *P. s. sappheira* Sands, (77-82, 84) *P. s. manskiei* Ring & Olive; (77, 79, 81, 83) ♂♂, (78, 80, 82, 84) ♀♀; (77-80, 82-83) uppersides, (81, 84) undersides. Localities: (78) 35 km NW Cooktown, Qld; (77, 79-82, 84) McIvor River, Qld; (83) Rouna Falls, Central Province, PNG.

Diagnosis. Males of *P. sappheira manskiei* differ only very slightly from males of *P. s. sappheira*, with the blue area of the hindwing of males extending to the postmedian region in *P. s. manskiei* but only to the median region in *P. s. sappheira*. The illustrated female in Braby (2004) is a paratype of *P. s. sappheira* from Papua New Guinea. This specimen of the nominotypical subspecies differs from *P. s. manskiei* by the extensive areas of white on the upperside of both wings.

The male genitalia were figured by Ring and Olive (1997) and compared with those of *P. nitens nitens* and *P. nitens lucina*.

Sands (1981a) proposed a *nitens* species-group for *P. nitens* and related species including *P. sappheira* and which now includes *P. s. manskiei*.

Variation. FWL: ♂♂, 10.8-12.8 mm; ♀♀, 12.7-13.3 mm. Females of *P. s. manskiei* may resemble female *P. moira* Grose-Smith (Forbes 1977) from Papua New Guinea, particularly in some forms when the forewing area of green is restricted. The extent of silvery greenish blue areas on the upperside of the forewing of females varies from an obscure narrow strip of greenish scales from the base to the cell, not reaching the inner margin (*e.g.* in Braby 2004), to an extensive oval and silvery green central area, extending from the base beyond the cell to the inner margin and postmedian region. The hindwing may be almost uniformly dark grey with paler costa, to light grey with obscure lighter grey scales in the central areas reaching the cell and postmedian region.

Distribution. Queensland: 39 km NW of Cooktown, 8 km SW of Mount Webb, McIvor River, 3 km NW of Hopevale, Cedar Scrub, Endeavour Falls, 3 km SE of Isabella Falls (ANIC, Ring and Olive 1997).

Biology. Larvae of *P. sappheira manskiei* feed on *Macaranga involucrata* (Ring and Olive 1997).

Discussion

Infraspecific variation in adult morphology, particularly that of females (*e.g.* Forbes 1977), has contributed to difficulties in associating sexes in several *Philiris* spp. from Papua New Guinea and without any evidence for seasonal variation. By contrast, variation in Australian species appears to be seasonal, evident in some species with allopatric distributions. Morphological variation, particularly the extent of white or blue scales, is thought to be induced by variation in temperatures (unpublished observations) during development; for example, females of *P. nitens* and *P. innotata* reared from immature stages during winter months are usually much paler, with more white or blue on the upperside respectively, than females reared during summer months. The extent of white areas on the upperside of both sexes of *P. diana* may also be temperature dependent.

Asymmetry in the male genitalia of some *Philiris* spp., in both shape and length of the valvae when viewed posteriorly, is known in other members of the *diana* species-group (*e.g. P. siassi* Sands: Sands 1979) and this unusual morphology is most easily observed when the genitalia are slide mounted. Moreover, the morphology of the male genitalia, including sclerites of the prezonal sheath, may vary with age of the specimen (for example, with freshly eclosed specimens when sclerotisation of the prezonal sheath is weakly developed) and the position of retractile cornuti in the aedeagus may also vary according to age.

Very little is known of the ecology of Australian *Philiris* spp. except for some larval food plants. The distribution of members of the *nitens* species-group is enigmatic, with all three species being allopatric in Australia and utilising the same food plant, *Macaranga involucrata*.

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